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ABSTRACT

An interdisciplinary critical reasoning and reading course (ICCR), developed to address problems of undergraduates who lack critical reasoning and oral and written communication skills, is described in this paper. The first two sections of the paper provide a rationale for the use of collaborative team instruction based on Feuerstein's model of cognitive modifiability through systematic and consistent mediation and a summary of the program development. The third section discusses the course, including the goals, objectives (increase students' awareness of their own learning strategies), ideas to be stressed (use of precise terminology), and examples of suggested activities. The fourth section analyzes the dynamic assessment techniques (pre and post) upon which the mediated instruction is based and by which students' growth is measured. Rationales are presented for the uses of various instruments and techniques to measure progress at the stages of data gathering, data elaboration (classification, comparison, summarization), and data communication. The other sections discuss the checklist of student behavioral changes, the interrelationship of ICCR with General Education Courses, and the reflective observations of the course's beneficial effects on both teachers and students. Concluding remarks articulate the reasons for a commitment to mediated cognitive instruction. Appendixes include sample syllabi and further information regarding Feuerstein's model. (LLZ)

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A Mediated Cognitive Program To Increase the Critical Reasoning and Reading Competencies of College Undergraduates and Pre-Collegiate Learners

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I. RATIONALE

Recent scholarly research and popular media reflect growing concern for the academic competencies of college undergraduates. International and national analyses of many current undergraduates cite significant cognitive and affective deficiencies, particularly in the area of critical reasoning and communication of that reasoning in spoken or written form. The literature of educational reform has raised relevant questions not only about the expected competencies of learners exposed to four years of undergraduate education but also about the reasons for limited competencies and ways of alleviating them.

Undoubtedly answers vary but educational research, especially the work of cognitive psychologists, frequently cites, as positive attributes of a liberal education, these characteristics:

> Perceptiveness in listening and observing; Intellectual curiosity; Willingness to defer judgment; Habit of logical reasoning; Habit of spontaneously comparing data to identify relationships; Sensitivity to important distinctions; Habit of looking for the neglected side of issues; Expressive and Receptive language facility; Systematic approach to solving problems and evaluating issues; Control over one's thoughts; Habit of summarizing one's own ideas and the ideas of others; Habit of objectively evaluating one's own and others' thoughts and arguments. 1

Although there are college students who exhibit many of these positive attributes, still others, including some Northeastern Illinois University (UNI) undergraduates demonstrate negative attributes or cognitive dysfunctions including:

> Blurred, sweeping perceptions; Mental boredom or passivity; Rushing to judgment with resultant shallowness of thought; Recurring rationalizing; Limited comparing so that ideas, events are isolated, episodically grasped; Indiscriminate generalizing and one shot thinking; Bandwagon allegiance to fads/limited sources of data; Limited vocabulary/concepts to communicate ideas, issues, Errors of omission; Lack of concentration and impulsivity; Lack of summative behavior; Illogical/unelaborated ideas/arguments. 2

These cumulative dysfunctions arise from varied factors, some separate, others related. The factors include such potentially negative influences as poverty, illness, limited intellectual stimulation, especially because of misdiagnosis and placement, impoverished language tools, especially where English is not the native tongue, and inconsistent instruction. An overriding consideration which results in the development of efficient cognitive functions, despite one or a series of negative influences, is the presence of mediation. Regardless of the number and kind of negative environmental influences present in students' earlier education, if the environment is mediated, that is, fully and regularly interpreted by a caring adult, effective cognitive functions can emerge.[3]

The role of mediation in cognitive development has been specifically identified and explicated by Reuven Feuerstein, an Israeli cogntive psychologist. Mediation is an enhancing cognitive process by which an informed learner interposes her/himself between the learner and stimuli, thus focusing, shaping, interpreting the learning environment. The significant feature of this mediational process is that it not only strengthens present guided exposure but also increases the learner's potential to profit from further direct exposure.[4]

A significant aspect of mediation is that it can be applied even in adult learning and its consistent application can result in substantive cognitive modification. The more appropriate, sequential and consistent this mediational application, the greater the increase in the kind and number of cognitive functions or proficiencies.

Advocates of Feuerstein's cognitive modifiability through mediation have noted the decrease in learners' cognitive deficiencies - and these decreases have been reflected not only in cognitive but also affective/motivational behaviors. Most significant changes have occurred when mediation has been characterized by: intentionality (purpose), meaning (significance) and transcendence(transferability). When these characteristics have been present, learners have become aware of increased feelings of competence and have been encouraged toward self-regulatory, autonomous learning.

Some undergraduates reflect potentially negative learning influences: unsystematic, random instruction in a variety of educational settings; passive acceptance of facts and figures, often unrelated and unelaborated; limited need for comparing, analyzing, integrating and/or

summarizing across subjects or content areas. Before such students can become effective information-processors, they need to acquire an increased awareness of their own mental processes, identification of the strengths and needs of these processes and opportunities to practice and to apply effective processes across a range of disciplines. Without such opportunities, regardless of the richness of individual course offerings, students will continue to display an episodic, unelaborated grasp of liberal learning, and few, if any, of the characteristics which such learning should foster.

II. PROGRAM DEVELOPMENT

Northeastern Illinois University has veloped a mediated cognitive program to increase the critical reasoning and reading competencies of its undergraduates. The Program is taught by an interdisciplinary faculty team from the College of Arts and Sciences and the College of Education. Because the team believes that critical reasoning and reading are frameworks for academic success, an interdisciplinary critical reasoning and reading course (ICRR) is taught in conjunction with certain General Education courses.

The ICRR course begins with a dynamic assessment of students' problem-solving behaviors in response to verbal stimuli. Some of the problem-solving tasks are figural/pictorial and do not require reading; others require both reasoning and reading strategies. Based on the results of pre-assessment, mediated instruction is given. Post-assessment is used to indicate the kind and degree of growth in critical reasoning and reading achieved by each student.

The ICRR course is a direct response to the development of the untapped skills essential to academic success. (p. 1, par.2).

III. DESCRIPTION OF INTERDISCIPLINARY REASONING/READING COURSE

COURSE TITLE: CRITICAL REASONING AND READING ACROSS DISCPLINES

GOALS: To provide undergraduates with opportunities to identify the interrelationships among required undergraduate courses, to practice effective information-processing strategies across disciplines, to synthesize the knowledge, attitudes, skills essential for interdisciplinary understandings and appreciation.

OBJECTIVES: To increase undergraduates' awareness of the need for effective interdisciplinary information-processing strategies.

To develop spontaneous use of these strategies across course content.

To communicate effectively, in oral and/or written form, the knowledge, attitudes and skills essential for interdisciplinary understanding and appreciation.

MAJOR IDEAS TO BE STRESSED:

1. Effective information-processors use precise terminology in studying and communicating newly acquired knowledge.
2. Effective information-processors use past experiences to unlock new learning.
3. Effective information-processors distinguish relevant from irrelevant information.
4. Effective information-processors search for relationships among events and/or content across disciplines.
5. Effective information-processors use systematic strategies to master interdisciplinary content.
6. Effective information-processors spontaneously compare and summarize newly acquired interdisciplinary knowledge.

ATTITUDES/HABITS TO BE FOSTERED:

1. Perceptiveness in listening and observing.
2. Continuous intellectual curiosity.
3. Spontaneous use of multiple sources of information.
4. Open-ness to divergent people, points of view.
5. Willingness to reopen issues, examine neglected sides of an issue and defer judgment.
6. Spontaneous comparative and summative behaviors.
7. Increased self-concept based on realistic analysis of one's cognitive/affective strengths/needs.
8. Task intrinsic motivation.
9. Control over the direction of one's thoughts.
10. Increased responsibility for the consequences of one's own decision-making.

SKILLS TO BE DEVELOPED:

1. Vocabulary and concepts for effective problem-solving across disciplines.
2. Clear, relevant observation of phenoma in the fine arts, humanities, social and natural sciences.
3. Spontaneous comparing, classifying of data

4. Hypothesizing based on empirical evidence
5. Argument analysis
6. Principle extraction
7. Evaluation based on objective criteria
8. Spontaneous summarizing
9. Validating solutions
10. Synthesis with generation of divergent solutions

An effective framework for instructional use is a cognitive mapping of interdisciplinary courses. The parameters analyzed in this framework are presented in a sample course syllabus. This map provides a common language and a speedy analysis of the cognitive/linguistic emphases of individual courses. (Appendix p. 20).

For each learning task or experience the following parameters are considered:

READINESS - this phase of the mediated learning experience focuses on its INTENTIONALITY (PURPOSE).

INTRODUCTION OF THE CONCEPT/OPERATIONS - this phase focuses on the explicit vocabulary and the implicit concept/mental activities which will be required during the completion of tasks.

PRACTICE OF CONCEPTS - this phase provides baseline data with respect to the strengths/needs of the learner for task completion. In short, specific tasks are presented and diagnostic data acquired concerning learner competencies. Alternative methods of intervention are revealed. Kind and amount of mediation are ascertained. * The SIGNIFICANCE (MEANING) of the learning is emphasized.

TRANSFER - Near and far transfer activities are presented to ensure that concepts/strategies/content are not only identified and analyzed but also extended beyond the particular/immediate needs/goals of a specific task.

*Depending upon the variety of needs reveqled in baseline analysis appropriate course modules can be applied:
(1) PRE-CRITICAL REASONING/READING, I
(2) CRITICAL REASONING/READING, II
(3) ADVANCED CRITICAL REASONING/READING, III

EVALUATION - a post-assessment of content/strategies is made. MEANING and TRANSCENDENCE are reiterated.

Consistent adherence to this format has two advantages: 1) It increases learners' awareness of systematic information-processing strategies and 2) It provides a didactic framework for shared faculty/mediators' planning and implementation across disciplines.

The unverse of ideas which a liberally educated learner can reflect upon, analyze and integrate includes: classification, constancy, space, time, seriation and causality. (Appendix p. 21).

Piagetian scholars have explored these basic concepts, specifically as they emerge and develop in early childhood. Feuerstein and others have traced these concepts beyond childhood, analyzing deficiencies in their orderly development as indicators of inadequate cognitive functioning. Feuerstein has developed a set of assessment (LPAD) and instructional materials (IE) which present carefully sequenced, comprehensive exercises in basic concepts of space, time, causality and others. Because these exercises increase in complexity and abstraction, they can be adapted to college learners who have been exposed to their basic concepts and usually understand and apply them in daily life but rarely relate or apply them to extend knowledge of academic materials. Again, this failure accounts for much of the fragmented knowledge gathered in early college learning. This transient, unrelated data gathering diminishes attempts to develop and extend effective liberal learning.

The following activities attempt to focus on basic concepts within a mediated framework of purpose, meaning and transcendence. Each concept is defined, analyzed, evaluated and integrated with varied modalities within and across disciplines. The goal is to increase learner awareness of these concepts, and create a need for their spontaneous use not only in daily life but also in academic life. To clarify the orderly progression of these concepts from simple everyday to complex scholarly comprehension and application, cognitive mapping is used.

ACTIVITIES FOR CLASSIFICATION

Classification is the mental process by which data received through the senses is sorted and organized. A prerequisite for classification is the ability to order objects, events, ideas on the basis of their similarities and differences. Readiness, therefore, begins with a discussion of comparison which is defined as: the superimposition of one object, event, idea, quality upon another in order to determine the way(s) each is similar to or different from the other.

MATERIALS: A set of attribute blocks which can be analyzed across the parameters of size, shape, color, density. To initiate and focus discussion, the mediator will specifically elicit from students relevant parameters for comparison. During this mediated discussion, care should be taken to insure that all learners: develop an accurate definition of comparison, distinguish relevant from irrelevant parameters based upon purpose and/or need and use uniform parameters for summarizing likenesses and differences.

Introduction/Practice of Concept: Just as we compare concrete objects to determine how they are the same and how they are different, we can compare specific events or general qualities.

NEAR TRANSFER ACTIVITIES - GUIDED PRACTICE

1. IE - COMPARISONS pp. 1,2,6,9,14 (Follow directions as indicated)
2. Students are asked to compare events such as the following:
   a. Their grammar school education/Their parents' grammar school education
   b. Invention of sewing machine/of computer
   c. World War I/II or Korea/Vietnam
3. Relevant qualities: In friends, in teachers, in students

FAR TRANSFER ACTIVITIES - TO ENSURE TRANSCENDENCE-COMPARISONS

1. Fictional characters - novels, short stories, plays (HOBERG)
2. Ideologies - Colonialism in India/in U.S.A. (BEVERLY)
3. Statistical Data - Mathematics (PATRICELLI)
4. Historical Data - History (POWERS)

Near transfer activities will be directly mediated so that all students become aware of purpose, meaning and transcendence.

Far transfer activities will be completed at approximately the same time as content is covered in respective courses. These activities will serve as a form of assessment for both process and content.

MATERIALS:

1. Selected pages from INSTRUMENTAL ENRICHMENT - Organization of Dots, Comparisons, Categorization, Instructions, Cartoons
2. Whimbey: Analytical Reasoning/Reading
   Problem-solving and Comprehension
3. Selections from Faculty team courses for Far Transfer

When pre-assessment indicates need: Adjusted pre-critical reasoning/reading course activities or advanced critical reasoning/reading activities.

The cognitive process of comparison is essential to the understanding and integration of disparate information; it fosters an awareness of relationships among apparently dissimilar data; forms the basis for the development of superordinate classifications and facilitates recall and interpretation.

COGNITIVE MAP OF CLASSIFICATION ACTIVITIES

CONTENT: CONCRETE WOODEN BLOCKS, WORDS, SENTENCES, LONGER PASSAGES OF CONTINUOUS DISCOURSE to be ordered, grouped perceptually, functionally and categorically.

MODALITY: FIGURAL, PICTORIAL, VERBAL

COGNITIVE PREREQUISITES:

Explicit - Vocabulary - attribute, parameter, similarity, difference, compare, relevant, irrelevant, categorize/classify, exclusion, inclusion, perceptual, functional

COGNITIVE OPERATIONS:

Implicit - DISCRIMINATION, COMPARISON, ANALYSIS, SYNTHESIS CLASSIFICATION

LEVEL OF COMPLEXITY - Low with only a few specific concrete objects
High as number and kind of units increase

LEVEL OF ABSTRACTION: Low with concrete objects which can be easily seen and handled; high with mental grouping and classification of concepts.

IV. COURSE IMPLEMENTATION

To analyze students' learning strategies, dynamic rather than static measures are used. Dynamic assessment is a diagnostic approach to the analysis of a learner's problem-solving behaviors in response to various stimuli. Active teaching is an integral part of the assessment.

The systematic analysis characterized by dynamic assessment is three-fold:

1) initial or baseline assessment of effectiveness with a task
2) training in the use of principles and strategies for effective task solution, with special emphasis on any cognitive dysfunctions evidenced during baseline assessment
3) post-assessment, during which the learner's independent use of principles and strategies of instruction are carefully observed and recorded.

There are four major differences between dynamic and static assessment. The objective role of the tester in static evaluation becomes one of active, guiding mediator in dynamic assessment; random test items are replaced by carefully sequenced problem-solving tasks, increasing slowly in levels of abstraction and complexity; rather than counting the correct number of responses, i.e., product, the solution process is analyzed and; the reasons for successes are interpreted, even if the successes are infrequent.

Although this form of assessment presents certain difficulties, especially the exact distinction between learner and teacher contributions, the procedure provides a unique opportunity for analysis of reasoning strategies and application of these strategies to a wide variety of increasingly more complex tasks.

Baseline or pre-assessment tasks used in ICRR include: a summary Organization of Dots sheet taken fron Feuerstein's Instrumental Enrichment materials.

The task requires the learner to join amorphous dots in such a way that geometric figures are formed in exactly the same size and shape as they appear in a model frame. Although the figures are constant with respect to size and shape, in each frame the figure orientation may differ from the model.

A second task, VARIATIONS, is based on Raven's Progressive Matrices.

Three configurations are given. The learner is expected to infer, by analogy, what the fourth configuration should be.

Both tasks provide opportunities for observation of learners' problem-solving behaviors at data gathering, data-elaborating and data-communicating stages of information-processing.

The DOT task includes observation of 8 characteristics for Implicit (I) and 12 characteristics for Explicit (E) behaviors. For each category, a score of 0 - no observable use of problem-solving behavior with respect to the characteristic listed; 1 - some but not completely adequate behavior and; 2 - adequate behavior for effective task completion is recorded. (Fig. 1)

DYNAMIC/DIAGNOSTIC ASSESSMENT			IMPLICIT			EXPLICIT		
/E	1.	OBSERVING STIMULI	0	1	2	0	1	2
/E	2.	DESCRIBING STIMULI	0	1	2	0	1	2
I/E	3.	IDENTIFYING TASK (General/Intentionality	0	1	2	0	1	2
I/E	4.	DEFINING TASK (Specific/Significance)	0	1	2	0	1	2
I/E	5.	LABELING (Vocabulary)	0	1	2	0	1	2
I/E	6.	PACING (Absence of undue haste/delay indicated by crossouts, erasures etc.)	0	1	2	0	1	2
I/E	7.	COMPARING (Adherence to size, shape)	0	1	2	0	1	2
/E	8.	CLASSIFYING (Use of multiple operations)	0	1	2	0	1	2
I/E	9.	HYPOTHESIZING (If..then inferences)	0	1	2	0	1	2
I/E	10.	EVALUATIVE REFLECTING	0	1	2	0	1	2
/E	11.	SUMMARIZING (Relevancy)	0	1	2	0	1	2
	12.	PROJECTING RELATIONSHIPS (Transcendence)	0	1	2	0	1	2

Figure 1

Implicit notations are based on a careful interpretation of the accuracy of each frame. Explicit notations are based on a careful interpretation of learner responses to either a written objective survey (fill in the blank or write a response) or an oral interview. A task-related vocabulary test is included with the DOT summary sheet.

There are six tasks each in VARIATIONS A-E for a total score of 30 points. Each task to be tallied is preceded by a practice task which permits learners to see the tasks as a figural form of analogical reasoning. The same characteristics observed in the DOT task can be observed in VARIATIONS. Of particular importance are the ability to project relationships and to make accurate inferences based on multiple sources of data.

Other pre-assessment tasks include Arthur Whimbey's Analytical Skills Inventory (WASI)[7] and the Watson-Glaser Critical Thinking Test (Form A).[8] Neither DOTS nor VARIATIONS are timed, although time required for

DOT completion is noted. The Whimbey and Watson-Glaser assessments require approximately fifty minutes for completion.

The WASI, with 38 items, includes vocabulary, analogies and word problems. The CTT, with 80 items, includes brief reading excerpts about which learners must reason inductively and deductively. Both are scored according to the protocols provided by their authors.

Baseline assessment indicated a need for mediated instruction, specifically in COMPARISON, INFERENCE, ANALOGY and SUMMARIZATION. Students understood and applied universal ideas in daily life. A major need was to increase their awareness of these ideas as they are embedded in academic tasks. Instructional units, therefore, were developed in each area. An example of comparison/classification is shown in the course description. Other units are similarly constructed. The list of efficient cognitive functions are emphasized throughout readiness, task observation and completion.

Opportunities for internalizing these functions are provided with concrete pictorial or figural stimuli first. This concrete situation is followed by an abstract verbal task. An example of the sequential development of a characteristic, such as COMPARISON would include:

1) Use of Attribute Blocks for identifying parameters of comparison such as size, shape, color, density.
2) Development of a definition of COMPARISON.
3) Application of the definition to a series of terms, such as church/factory; lake/river; milk/cola; love/hate.
4) Application to an expository passage - comparative attributes explicitly stated
5) Application to two expository passages - comparative attributes fairly explicit
6) Application to three expository passages with comparative attributes implicitly stated.
7) Application to several chapters of a textbook.
8) Written comparison with comparative attributes to be identified by the student writer.

The rationale for the use of all non-reading tasks is Feuerstein's list of cognitive functions (Appendix p. 19) and their internalization as a means of more efficient information-processing.

The rationale for the use of all reading tasks is the theory of reading as an active, interactive process of reasoning in response to print. The concept of metacomprehension - awareness of reading text and strategies to extract text meanings - complements the concept of metacognition stimulated by mediated instruction. Raising the level of awareness of task demands, spontaneous comparing, hypothesizing about possible task solutions, reflecting on the appropriateness of problem-solving efforts, summarizing activities and projecting relationships to novel situations are metacognitive behaviors which appear to enhance comprehension of any stimuli. Metacognitive activities particularly increase the reasoning strategies essential to proficient reading.

An additional theory-based activity is the use of prior knowledge to increase reading comprehension. Systematic building of knowledge is exemplified by the following example of mediated classroom instruction. Knowing that a single reading text would be inadequate to meet the needs of a diversified group ranging in composite ACT scores from 12-28, and reading proficiency with college material ranging from Stanines 4-9, the instructor chose a variety of reading materials. Reading of expository essays began with "Why We Are Inferior to the Japanese" [9] which allowed students to compare U.S. and Japanese education. An additional essay, "Why We Are Not Inferior to the Russians" [10] also emphasized certain differences in American and Russian education. T. Bell's "Discipline, Education's Missing Link" [11] emphasized certain needs in American education. A Kappen selection, "Should We Mimic Japanese Education", [12] led to the summative activity which follows.

COMPARATIVE/SUMMATIVE BEHAVIOR - FINAL EVALUATION

This term we have explored the definition of intelligence as the capacity of an individual to use past experiences to adapt to new learning. In developing comparative and summative behaviors, one continuing topic has been EDUCATION.

Using essay 1 -WHY WE ARE INFERIOR TO THE JAPANESE
3 -DISCIPLINE, THE MISSING LINK
4 -SHOULD WE MIMIC JAPANESE EDUCATION
(all examples of past experiences)

WRITE a well-developed short paper (3-5 paragraphs) on American education.

POSSIBLE STARTERS:

Education in the U.S. will always be a major concern because a well informed learner is an important cornerstone in a democracy. A well-informed learner is able to think critically and creatively about personal, national, and international problems/concerns.

In the U.S. education_____

In Japan education_____

Education in the U.S. should_____

_____

You do not need to begin in this way. You do need to use all that you have learned about developing a topic. Be precise and accurate; apply reasoned judgment at DG/DE/DC levels.

V. STUDENT BEHAVIORAL CHANGES - COGNITIVE CHECK LIST

Students in ICRR courses are taught to analyze their information-processing behaviors across several stages of data-gathering (DG), data-elaboration (DE) and data-communication (DC), beginning with the analysis of pre-assessment tasks. Students maintain a cognitive efficiency checklist for self analysis; the instructor also maintains a separate checklist for each student. The checklists form the basis for analysis of cognitive strengths and needs. Students' analyses facilitate their growth in autonomous learning through a clearer understanding of the strategies that enhance cognitive efficiency. Each task is analyzed in terms of DG/DE and DC. The analysis is particularly helpful in assessing oral and written summative behaviors.

Post-assessments are similarly assessed. Materials include alternate forms of CTT (Form B) and WASI (II) and the same and one additional novel DOT and VARIATION exercise.

VI. INTERRELATIONSHIP of ICRR with GENERAL EDUCATION COURSES

The unique feature of the Mediated Cognitive Mediation Program is the collaboration among the faculty team. Three of the General Education faculty revised their course syllabi according to the Cognitive Map, to reflect increased emphasis on the problem-solving behaviors contained in the list of cognitive functions.

The Team meets twice monthly to discuss students' information-processing strategies with respect to each course. Courses are: Introduction to the Social Sciences; Afro-American History; Colonial Systems;

and Introduction to World Literature. Common language (DG/DE/DC) enables the Team to identify and to clarify effective student behaviors. Careful scrutiny of course assignments enables the faculty to base instruction on students' present abilities at the same time that it supports their attempts to increase students' learning potential, i.e., team sharing promotes an increased awareness of the need to provide for both success and challenge.

VII. REFLECTIVE OBSERVATIONS

The assess/mediate/re-assess process has become habitual with the ICRR course and has increased students' awareness and their achievement. Generally, weak information-processing strategies occurred at the data gathering stage. Many students began a task impulsively without a clear understanding of it or of the strategies needed for its effective completion. At the data elaboration stage many students failed to compare spontaneously, and, therefore, were unable to see the relationships between and among tasks. Little wonder that they failed to see larger interdisciplinary relationships. Further indication of the need to develop comparative behavior was the frequency with which they responded to a comparative question with isolated descriptions.

Example: A square is a figure with 4 equal sides.
A triangle has 3 sides.

Rather than: A square is a figure w/ 4 equal sides, while a triangle is a figure w/ 3 sides, two of which may be equal in length.

The second definition suggests that the learner may be holding in his/her mind and comparing both figures simultaneously. The first suggests that figures are being viewed separately. Similar isolated descriptions were given in response to such ideas as the industrial/post-industrial eras; and education in the U.S./Japan/Russia.

Yet well elaborated comparisons enable learners to relate apparently unrelated data and to engage in sustained, abstract representational thinking. Such thinking enables learners to summarize relevant information from previous experiences in order to understand new learning experiences. Little wonder that retarded performers, learners with untapped potential, are characterized by Feuerstein as inadequate users of spontaneous comparative and summative behaviors. Obviously at the stage of explicit data

communication, such learners give unelaborated, skimpy responses, often unrepresentative of their true knowledge of the information under consideration.

Systematic guided practice in task identification, strategy application and principle (rule) elicitation helped many students to use comparing and summarizing spontaneously and consistently. Such use increased their general cognitive efficiency. For some, this use was indicated in large jumps even on standardized tasks; for example, a pre-assessed CTT score increased from the 3rd to the 95th percentile at post-assessment.

Additionally, there were observable classroom changes in both cognitive and affective behaviors: deliberate defining of tasks, their demands and strategies for their completion; spontaneous seeing of relationships; well-elaborated summarizing of activities; increased awareness of relevance; ability to concentrate on tasks, in fact, sometimes such sustained concentration that efforts continued beyond the class session. Instructor and students were startled to find the next class waiting anxiously at the door.

Although some educators contend that process (ICRR) and content (General Education courses) rarely develop effectively in a skills/content program, collaborative mediated instruction at Northeastern has proved effective in reducing course attrition rates, in enhancing student understanding of commonalities across disciplines, and, thereby, in increasing and sustaining student achievement.

A collaborative interdisciplinary process/content program has other advantages. Effective learning strategies once identified in ICRR can be applied to near-transfer tasks, and, later, in far-transfer tasks in an observable, sequential manner. Wide applicability of strategies increases student awareness of integrated knowledge bases and fosters a sense of relationships across all learning. (Transcendence). These understandings can do much to reduce an episodic grasp of reality, the inability to see and to apply related knowledge, evidenced by so many undergraduates. This episodic grasp of reality is often fostered, though unintentionally, by undergraduate programs which require students to enroll in forty hour course sequences without specifically clarifying the relationships within these sequences.

VIII. CONCLUSION

The Interdisciplinary Critical Reading and Reasoning Program represents a distillation of six years of learning based on Feuerstein's theory of cognitive modifiability through systematic and consistent mediation. Although the interdisciplinary critical reasoning and reading course, initially focuses on specific learning materials (Instrumental Enrichment), many other materials are used. In fact, the collaborative team continually explores and responds to the theory of mediated instruction so that the materials and methods of instruction are continually expanding.

A constant in this process of faculty/curricular development is the use of Feuerstein's cognitive functions as indicators of student readiness for increasingly more abstract and complex learning. This shared process is exemplified in the cognitive mapping of course content in order to make more explicit commonalities in cognitive demands across disciplines. A further constant is the commitment to mediation. In large General Education course sections the efficient and acceptable mode of presentation is lecturing. Mediation requires continuous teacher/student interactions, varied materials and methods of presentation, carefully sequenced tasks and much non-judgmental, non-product-oriented but process-observable practice.

The writer sees two additional aids in UNI's collaborative team effort. The first is the institutionalization of the Interdisciplinary Reasoning and Reading course through its incorporation into the General Education Program. The second is a required reading course enrollment for all entering students who demonstrate a need for increased reasoning and reading proficiency. Almost every introductory General Education course assumes a fairly high level of reading proficiency in order to understand textbooks and respond to objective, multiple choice examinations. Some students, who completed the ICRR course, especially through the careful use of the cognitive function checklist, so increased their cognitive awareness and strategy development that they automatically transferred these behaviors to the linguistic demands of their General Education courses. Still others, probably the larger number, internalized some metacognitive strategies but need further enhancement of explicit reading and reasoning strategies. A flexible reading module enrollment would provide for the specific needs of UNI's varied student body.

The process of cognitive mapping in order to clarify critical reasoning/reading demands across disciplines, the use of a cognitive function checklist for student and teacher analysis and of carefully sequenced mediated instructional units is equally appropriate for the development of collaborative high school teaching teams. In fact, such sharing can be a timely response to curricular changes required by recent educational reform legislation. By such sharing, critical reasoning and reading takes its rightful place as the basic skill undergirding academic success. The format of UNI's mediated cognitive program is easily adapted both to elementary and high school curricula. The process is the same; the only change is in the levels of abstraction and complexity of the instructional materials.

Educators continue to raise relevant questions about college students' competencies. Continued support for the interdisciplinary mediated model of collaborative team instruction provides Northeastern with a means of fulfilling its urban mission - to provide educational opportunities to diversified learners. Space has already been provided for the ICRR instructor to offer individual and small group assessment and instruction. Continual action research by the collaborative team may result in an instructional model which so enhances the competencies of diversified undergraduates with untapped learning potential, that they may not only matriculate but also graduate.

The collaborative model responds to instructors' need to enjoy the feeling of shared purpose and goals. Collegiality, through regular analytical and evaluative discussions of students' basic reasoning/reading strengths and needs, enhances the art of teaching and learning.

Collaborative interdisciplinary instruction is sometimes difficult, often slow, always demanding. The art of compromise, giving up a part of one's vision in order to share another's, finding and implementing more effective techniques - the entire collaborative enterprise allows faculty to experience again the cognitive/affective growth which they wish to foster in their students.

There is no question of the worth of the enterprise. Today's undergraduates need every opportunity to experience liberal learning, especially to see it discussed and modeled by their professors. Such modeling ensures students that liberal learning is, indeed, a lifetime experience; that college is not simply parcels of courses for possible career insurance. Learning to learn more effectively, through the develop-

ment of critical reasoning and reading, is not only the hallmark of a liberal, interdisciplinary education. It is the single constant that both validates and perpetuates the knowledge, skills and attitudes that enable learners to survive in an ever changing, complex, technological world. The key to that survival is certainly the development and expansion of reasoned judgment in response to personal, community, national and international issues.

Appendix

Sample list of Cognitive Functions (Positive Learning Attributes) and Cognitive Dysfunctions (Negative Learning Attributes) at Data Gathering (Input), Data Elaborating and Data Communicating (Output) Stages of information-processing

Cognitive Function	Cognitive Dysfunction
Clear perception	Blurred and sweeping perception
Need for precision	Lack of, or deficient need for, precision/accuracy in DG.
Broadening the mental field	Narrowness of the mental field
Projecting relationships	Episodic grasp of reality
Visual transport	Inability to carry a mental picture to another place for comparison

A full identification and explication of Cognitive Functions are to be found in Reuven Feuerstein's Instrumental Enrichment text and also in the Manual to Instrumental Enrichment materials - Set 1.

The Manual also contains instructions and discussion of COMPARISON and CLASSIFICATION, referred to in classroom discussions, p. 6.

SAMPLE SYLLABUS - INTRODUCTION TO SOCIOLOGY

CONTENT: Science of Human Relations

MODALITIES: Primarily verbal including: oral/aural; reading, writing

KNOWLEDGE: To introduce students to the discipline of sociology and increase their understanding of the quantity and quality of social interactions and their obvious and subtle effects.

SKILLS needed/assumed to master course content/requirements:

Identifying/Defining terms/concepts relevant to the field
Paraphrasing Text
Identifying, Comparing/Verifying Relationships - sequential, comparative, causal, both explicit and implicit
Categorizing/Classifying Data
Reasoning hypothetically
Analyzing Assumptions
Drawing Conclusions
Evaluating Data
Summarizing Data

ATTITUDES to be developed:

Increased awareness of gaps in one's knowledge
Increased awareness of one's own reasoning processes
Heightened respect for the discipline of sociology
Heightened respect for one's own growing abilities to process data and problem-solve based on sociological insights.

LEVEL OF ABSTRACTION: Varies across syllabi but is generally high, since content is necessarily verbal and assumes identification, analysis, synthesis of data (theory into practice)

LEVEL OF COMPLEXITY: Reading demands range from 9-14 chapters of material - rough estimate of readability grades 10-14. Difficulty lessened somewhat where class lectures/discussions clarify/focus on relevancies.

Content/process of written assignments cannot easily be determined from syllabi. But the enclosed list of cognitive functions can be used as a guide to prerequisites assumed in detailed assignments. My experience with a cross section of undergraduates indicates that many do not automatically compare and summarize data with ease or accuracy.

COGNITIVE MAP - COLONIAL SYSTEMS - Dr. Sherman Beverly

Content: Human group relationships

Modality: Verbal, pictorial, graphic, numerical

Phases: All

Operations: Recognition, Identification, Comparison, Categorization, Inference (Analysis, Synthesis, Evaluation)

Level of Complexity: Medium to high, depending upon experiential background, familiarity with vocabulary/concepts

Level of Abstraction: Medium to high - different levels reached by different students:
Identification
Enumeration with comparisons
Classification
Hypotheses ——→ Generation of principles
Syllogistic reasoning

I. Language content/concepts

A. Explicit (Sample vocabulary)

Colonialism/Colony
Colonizers/Colonized
Imperialists
Protectorates
Assimilate
Petrify
Christianity
Missionary
Oppression
Revolution
Vulnerability

B. Implicit (Operations)

1. Identification
2. Classification
   a. Sorting
   b. Class inclusion
   c. Class exclusion
   d. regrouping
3. Conservation
4. Time
5. Seriation
6. Causality
7. Inferences
8. Syllogisms

II. Teacher Language (written or oral instruction)

A. Explanation/direction Simple X Complex ___ Confusing ___

B. Use of multiple concepts: Overall concept of human relationships, Specifically with control of one group over another ——→ State of Colonialism

C. Questions: Form Statements
Explain, describe, discuss
Type Misplaced sentences/paragraphs to be ordered

D. Speaking mode: Length: Leisurely Rate: Conversational

III. Student language (student requisites)

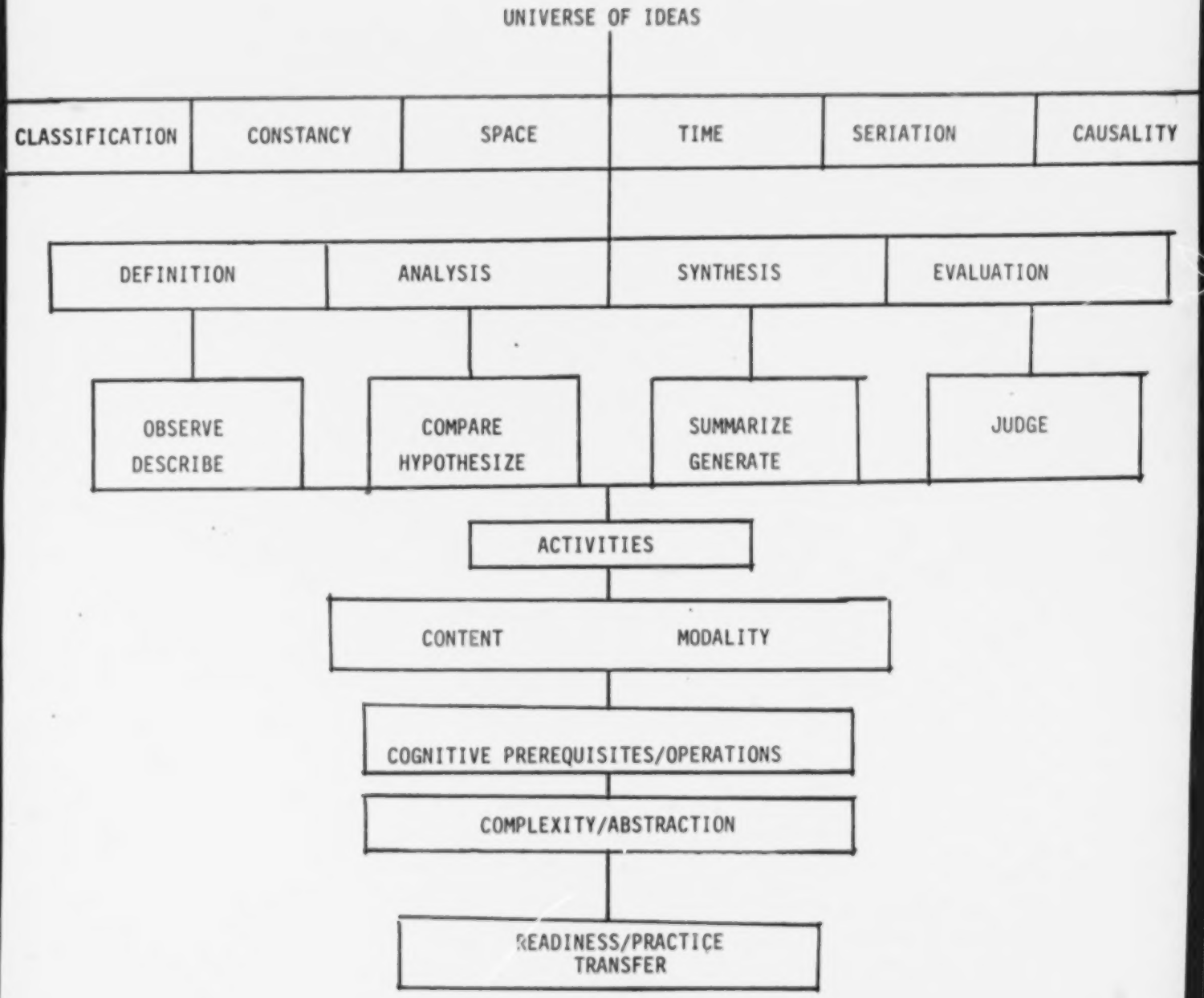
A. Comprehension
Vocabulary: Specific terminology listed under IA
Syntax (sentence structure): Double negatives, subjunctive mood, syllogistic reasoning

B. Production:

Speaking - daily oral discussions of content

Reading - weekly assignments from varied materials

Writing - weekly essay responses to problems posed


UNIVERSE OF IDEAS
CLASSIFICATION
CONSTANCY
SPACE
TIME
SERIATION
CAUSALITY
DEFINITION
ANALYSIS
SYNTHESIS
EVALUATION
OBSERVE
DESCRIBE
COMPARE
HYPOTHESIZE
SUMMARIZE
GENERATE
JUDGE
ACTIVITIES
CONTENT
MODALITY
COGNITIVE PREREQUISITES/OPERATIONS
COMPLEXITY/ABSTRACTION
READINESS/PRACTICE
TRANSFER

EFFECTIVE THINKERS/READERS/WRITERS*

1. Always clearly identify the problem or task.

2. Use past experience to unlock new learning.

3. Distinguish relevent from irrelevent information.

4. Use precise terminology in analyzing and communicating newly acquired knowledge.

5. Use systematic strategies to master content.

6. Search for relationships among events and/or ideas.

7. Restrain thoughtless, hasty trial and error responses.

8. Automatically compare and summarize information.

9. Explore more than one response or solution.

10. Check and verify solutions or conclusions.

*Adapted from Reuven Feuerstein's Cognitive Functions/Dysfunctions as they appear in DYNAMIC ASSESSMENT and INSTRUMENTAL ENRICHMENT.

NOTES

[1] Conference on Critical Thinking and Moral Development, Sonoma State University, CA, 1984

[2] Adapted from Conference Notes

[3] Reuven Feuerstein, Instrumental Enrichment, University Park Press, Baltimore, Maryland, 1980

[4] Feuerstein, Instrumental Enrichment

[5] Theresa Booker, Learning to Learn More Effectively, Northeastern Illinois University Teacher Corps Conference, Chicago, IL., May, 1980

[6] Reuven Feuerstein, Dynamic Assessment of Retarded Performers (LPAD), University Park Press, Baltimore, Maryland, 1979.

[7] Arthur Whimbey, Problem solving and Comprehension, Franklin Institute Press, Philadelphia, 1982, pp. 3-10.

[8] Watson-Glaser, Critical Thinking Appraisal, The Psychological Corporation, Subsidiary of Harcourt Brace Jovanovich, Inc., 1980 (Forms A and B).

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[10] H.A. Bethe, "Why We Are Not Inferior to the Russians", in Critical thinking and Reading Across the Curriculum.

[11] T.H. Bell, "Is Discipline Education's Missing Link", 1984 address.

[12] John Cogan, "Should the U.S. Mimic Japanese Education?", Phi Delta Kappan, V. 65, March, 1984.

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